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Determination of pure beta emitters using LSC for characterization of waste from nuclear decommissioning

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Abstract - 16

With increasing numbers of nuclear facilities, especially nuclear power reactors, being closed in recent years and from now on, a considerable work is going to be carried out all over the world for decommissioning these nuclear facilities. For this purpose, characterization of various wastes from decommissioning is required for evaluation of the radioactivity inventory in various materials and decision making for management of the produced waste. This is carried out by quantitative determination of various radionuclides present in the materials.

The neutron activation products of components and impurity in the materials used in the nuclear facilities are the main contributors to the total radioactivity, especially in the construction materials. But long-lived radionuclides are the major concern in view of decommissioning and waste depository. Among these radionuclides, determination of pure beta emitters is the major challenges, because they could not be measured without separation from the matrix of the samples and from all other radionuclides, this entitles them as the radionuclides of difficult to measure. Liquid scintillation counting(LSC) is the most convenient and effective method for the measurement of these radionuclides after chemical separation.

In the past few years, our laboratory has developed a series of radiochemical analytical methods aiming at characterization of various decommissioning waste by determination of various radionculides of difficult to measure. This presentation gives an overview of these analytical methods with some examples including (1) rapid determination of tritium and ^{14}C in solid materials, such as graphite, concrete, steel, aluminium, paint, silica gel, soil, and dust; (2) determination of ^{14}C in high tritium samples, such as heavy water, waste water, and oil; (3) determination of ^{36}Cl and ^{129}I in graphite, steel, concrete, waste water, and dust; (4) determination of ^{41}Ca and ^{90}Sr in concrete; (5)

determination of ^{55}Fe and ^{63}Ni in graphite, concrete, steel, aluminum, sediment, sand, waste water, seawater, and lichens. The main problems and challenges in the LSC measurement of these radionculides and improvement in source preparation and instrumental calibration and correction will be highlighted.

Notes:

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